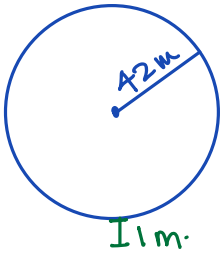
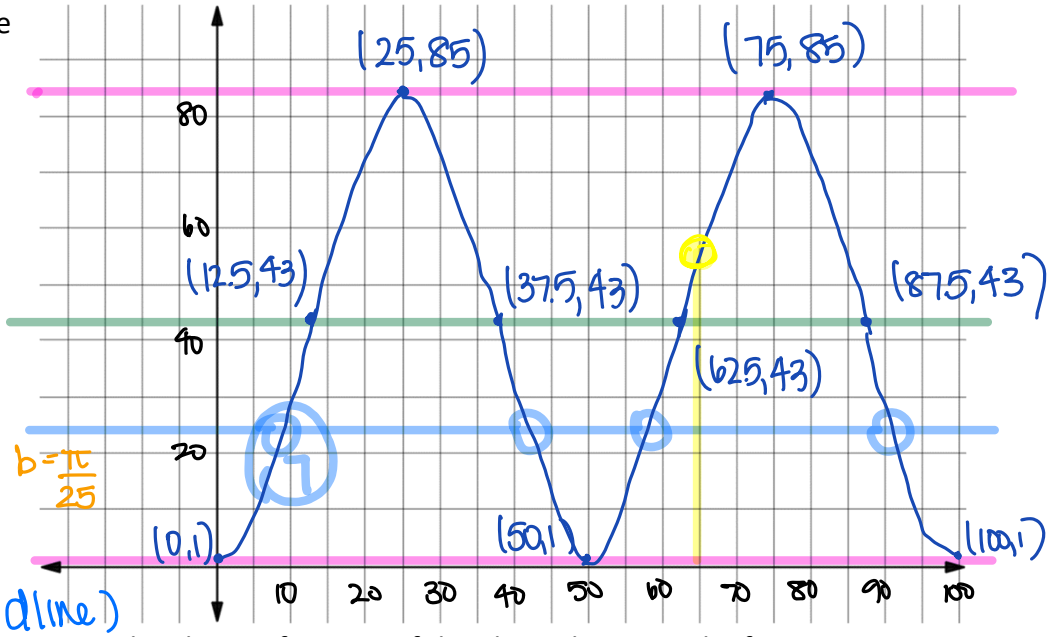
Name: _____ Date: _____

Learning Goal 5.1	Graphing primary trigonometric functions, including transformations and characteristics

Example A Ferris wheel has a radius of 42 m. Its centre is 43 m above the ground. It rotates once every 50 s. Suppose you get on when the Ferris wheel is at its lowest point at $t = 0$ sec.

a. Graph how your height above the ground varies during the first two cycles.





amp. $a = 42$

period $b = 2\pi \times \frac{25}{\pi} = 50$ $\quad b = \frac{\pi}{25}$

PS. c

VD. $d = 43$ (dist. to midline)

b. Write an equation that expresses your height as a function of the elapsed time, in the form

$$h(t) = a\sin b(t-c) + d \quad \text{or} \quad h(t) = a\cos b(t-c) + d$$

$= 42\sin\frac{\pi}{25}(t-12.5)+43$ $\quad = -42\cos\frac{\pi}{25}t + 43$

$= -42\sin\frac{\pi}{25}(t-37.5)+43$ $\quad = 42\cos\frac{\pi}{25}(t-25)+43$

c. Estimate your height above the ground after 65 s.

≈55 m?

$h(65) = 42\sin\frac{\pi}{25}(65-12.5)+43$

$\doteq 56$ m

d. Estimate one of the times when your height is 25 m above the ground.

BEDMAS } trig

$25 = 42\sin\frac{\pi}{25}(t-12.5)+43$

$-43 \qquad\qquad -43$

$\frac{-18}{42} = \frac{42}{42}\sin\frac{\pi}{25}(t-12.5)$

$\sin^{-1}\left(-\frac{3}{7}\right) = \sin^{-1}\left(\sin\left(\frac{\pi}{25}(t-12.5)\right)\right)$

$\frac{25}{\pi}\times\frac{\pi}{25}(t-12.5) = -0.443\times\frac{25}{\pi}$

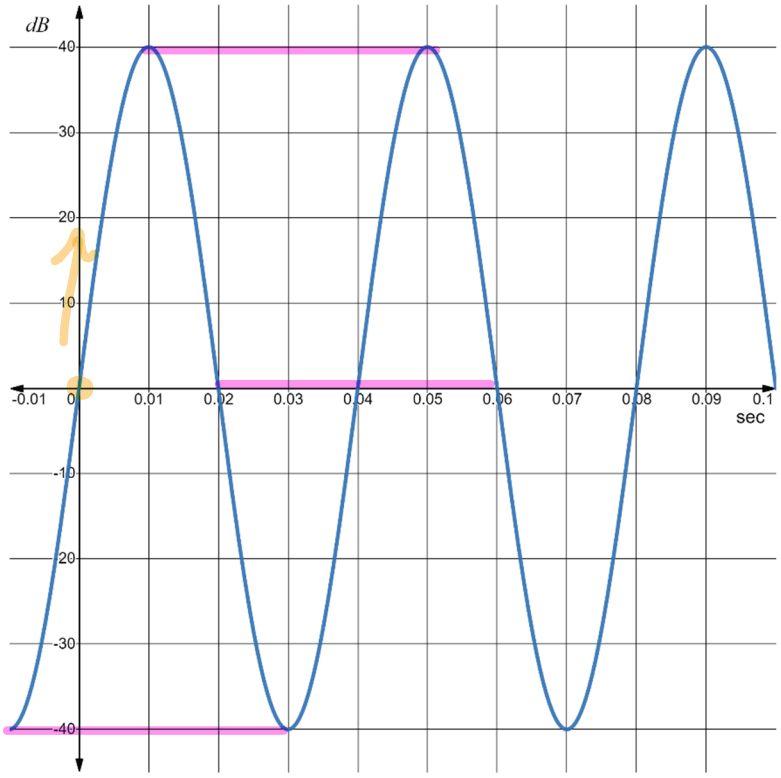
$t-12.5 = -3.52$

$+12.5 \quad +12.5$

$t \doteq 9$ s.

Assignment | p. 250 # 1 – 9, 11, 12, 14 – 16, 26, 27, C2 | Quiz Next Day!

Example Sounds are modelled by trigonometric functions. The intensity, or loudness, of the sound is measured in decibels, dB. The pitch is related to the frequency of the vibrations and is measured in hertz, Hz (the number of cycles per second). The graph shows cycles of the sound produced by a tuning fork.



a. What is the time for one complete cycle?

0.04 s.

b. What is the period of this graph?

$0.04 = \frac{1}{25}$

$2\pi \times \frac{1}{50\pi} = \frac{1}{25}$ $b = 50\pi$

c. What is the amplitude of this graph?

40 dB

d. What is the frequency of the sound produced?

$0.04 \times \quad = 1$

$\frac{1}{25} \times 25 = 1$

25 Hz.

e. What is an equation that could represent this sound?

$y = 40 \sin 50\pi t$